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10/556,663	11/11/2005	Morito Akiyama	HARAP0166US	8510

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EXAMINER	
ROSENAU, DEREK JOHN	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/556,663	AKIYAMA ET AL.	
	Examiner	Art Unit	
	Derek J. Rosenau	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22 and 26-29* is/are pending in the application.

4a) Of the above claim(s) *1-12 and 26-29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 December 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings were received on 9 December 2008. These drawings are accepted.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 13-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada et al. (US 2002/0190814).

4. With respect to claim 13, Yamada et al. discloses a laminate (Fig 14), which is applied as an electronic component material having a piezoelectric property (Paragraph 34), comprising: a substrate (item 11); a first wurtzite layer (item 42) made of a wurtzite crystalline structure compound (Paragraph 45, both AlN and ZnO are wurtzite structure compounds) so as to have a thickness of 50 nm to 200 nm (Paragraph 141); a functional material layer (item 44) which covers an entire region of the first wurtzite crystalline layer (Fig 14) and which is made of an elementary substance of molybdenum or tungsten or of a compound containing at least one of molybdenum and tungsten (Paragraph 48) so as to have a thickness of 100 nm to 300 nm (Paragraph 142); and a second wurtzite crystalline layer (item 41) which covers the functional material layer (Fig 14) and is made of the wurtzite crystalline structure compound (Paragraph 45, both AlN and ZnO are wurtzite structure compounds), and the first wurtzite crystalline layer, the

functional material layer and the second wurtzite layer being stacked on or above the substrate (Fig 14).

5. With respect to claim 14, Yamada et al. discloses the laminate as set forth in claim 13, wherein the substrate is made of any one of a monocrystalline material, a polycrystal material, and an amorphous material (Abstract, silicon can be either a monocrystalline or a polycrystalline material).

6. With respect to claim 15, Yamada et al. discloses the laminate as set forth in claim 13, wherein, as best the examiner can ascertain, a c-axis perpendicular to a (0001) surface of the wurtzite crystalline structure compound constituting the first wurtzite crystalline layer and a c axis perpendicular to a (0001) surface of the wurtzite crystalline structure compound constituting the second wurtzite crystalline layer orient substantially perpendicular to a surface of the substrate (Paragraph 178).

7. With respect to claim 16, Yamada et al. discloses the laminate as set forth in claim 13, wherein the first wurtzite crystalline layer and the second wurtzite crystalline layer contain as a main constituent one compound or more selected from the group consisting of aluminum nitride, gallium nitride, indium nitride, and zinc oxide (Paragraph 45).

8. With respect to claim 17, Yamada et al. discloses the laminate as set forth in claim 13, wherein the first wurtzite crystalline layer and the second wurtzite crystalline layer contain aluminum nitride as the main constituent (Paragraph 45).

9. With respect to claim 18, Yamada et al. discloses the laminate as set forth in claim 13, wherein the first wurtzite crystalline layer and the second wurtzite crystalline layer are made of a same constituent (Paragraph 45).

10. With respect to claim 19, Yamada et al. discloses the laminate as set forth in claim 13, wherein the functional material layer contains any one of a monocrystalline material, a polycrystalline material, and an amorphous material (Paragraph 45, Au, Pt, W, and Mo are all polycrystalline materials).

11. With respect to claim 20, Yamada et al. discloses the laminate as set forth in claim 13, wherein the functional material layer contains a conductive material (Paragraph 45, Al, Pt, W, and Mo are all conductive materials).

12. With respect to claim 21, Yamada et al. discloses the laminate as set forth in claim 13, wherein the functional material layer contains a metal (Paragraph 45, both Au, Pt, W, and Mo are all metals).

13. With respect to claim 22, Yamada et al. discloses the laminate as set forth in claim 13, wherein the functional material layer contains a metal having a body-centered cubic structure or a hexagonal close-packed lattice structure (Paragraph 45, Mo and W are both body-centered cubic structures).

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. Claims 13-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masuo et al. (JP 57-048820) in view of Higaki et al. (US 5426340).

16. With respect to claim 13, Masuo discloses a laminate (Fig 2) comprising: a substrate (item 10); a first wurtzite layer (item 11) made of a wurtzite crystalline structure compound (Abstract, both AlN and ZnO are wurtzite structure compounds); a functional material layer (item 12) which covers an entire region of the first wurtzite crystalline layer (Fig 2); and a second wurtzite crystalline layer (item 13) which covers the functional material layer (Fig 2) and is made of the wurtzite crystalline structure compound (Abstract, both AlN and ZnO are wurtzite structure compounds), and the first wurtzite crystalline layer, the functional material layer and the second wurtzite layer being stacked on or above the substrate (Fig 2).

Masuo et al. does not disclose expressly that the first wurtzite crystalline layer has a thickness of between 50 nm and 200 nm or that the function material layer is made of an elementary substance of molybdenum or tungsten or a compound containing at least one of molybdenum and tungsten and having a thickness of between 100 nm and 300 nm.

Higaki et al. teaches a surface acoustic wave device in which the piezoelectric layer has a thickness of between 50 nm and 200 nm (column 8, lines 50-55) and the functional material layer is made of an elementary substance of molybdenum or tungsten or a compound containing at least one of molybdenum and tungsten (column 6, lines 46-56) and having a thickness of between 100 nm and 300 nm (column 8, lines 50-55).

At the time of invention, it would have been obvious to combine the thicknesses and materials of the piezoelectric and electrode layers of Higaki et al. with the surfaces acoustic wave device of Masuo et al. for the benefit using a electrode material having low resistivity and that can be formed at low temperatures (column 6, lines 46-56). In addition, it has been held that optimization by routine experimentation is obvious to a person of ordinary skill in the art (*In re*

Aller, 105 USPQ 233); therefore, it would have been obvious to a person of ordinary skill in the art to form the wurtzite crystalline layers and functional material layers to the appropriate thicknesses to achieve the desired device properties.

17. With respect to claim 14, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the substrate is made of any one of a monocrystalline material, a polycrystal material, and an amorphous material (Abstract, glass is an amorphous material).

18. With respect to claim 15, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that a c-axis perpendicular to a (0001) surface of the wurtzite crystalline structure compound constituting the first wurtzite crystalline layer and a c-axis perpendicular to a (0001) surface of the wurtzite crystalline structure compound constituting the second wurtzite crystalline layer orient substantially perpendicular to a surface of the substrate (Abstract).

19. With respect to claim 16, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the first wurtzite crystalline layer and the second wurtzite crystalline layer contain as a main constituent one compound or more selected from the group consisting of aluminum nitride, gallium nitride, indium nitride, and zinc oxide (Abstract).

20. With respect to claim 17, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the first wurtzite crystalline layer and the second wurtzite crystalline layer contain aluminum nitride as the main constituent (Abstract).

21. With respect to claim 18, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the first wurtzite crystalline layer and the second wurtzite crystalline layer are made of a same constituent (Abstract).

22. With respect to claim 19, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the functional material layer contains any one of a monocrystalline material, a polycrystalline material, and an amorphous material (Abstract, Au and Al are both polycrystalline materials).

23. With respect to claim 20, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the functional material layer contains a conductive material (Abstract, both Al and Au are conductive materials).

24. With respect to claim 21, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 13. Masuo discloses that the functional material layer contains a metal (Abstract, both Al and Au are metals).

25. With respect to claim 22, the combination of Masuo et al. and Higaki et al. discloses the laminate as set forth in claim 21. Higaki et al. discloses that the functional material layer contains a metal having a body-centered cubic structure or a hexagonal close-packed lattice structure (column 6, line 46-56, Mo has a body-centered cubic structure).

Response to Arguments

26. Applicant's arguments, see amendments/arguments, filed 9 December 2008, with respect to claims 15 and 16 have been fully considered and are persuasive. The 35 U.S.C. 112 rejections of claim 15 and 16 have been withdrawn.

27. Applicant's arguments with respect to the rejections of claims 13-22 over Masuo et al. have been considered but are moot in view of the new ground(s) of rejection.

28. Applicant's arguments filed 9 December 2008 have been fully considered but they are not persuasive.

29. Applicant argues that Yamada et al. does not disclose the layer thicknesses and materials. However, these features can be found at paragraphs 141 and 142 of Yamada et al.

30. Applicant argues that the sequence of layers of Yamada et al. is opposite that of the claimed structure. Applicant argues that the structure of Yamada includes a piezoelectric layer between two electrode layers, and that the claimed structure includes an electrode layer between two wurtzite (piezoelectric) crystalline layers. However, applicant's characterization of Yamada et al. is only true for the embodiment of figure 1. In the embodiment of figure 14, Yamada et al. discloses an alternating sequence of three electrodes and two piezoelectric layers. The middle three layers of this sequence include an electrode layer between two piezoelectric layers. Therefore, the structure of Yamada et al. includes a sequence of layers that is the same as that of the claimed structure.

31. Applicant argues that the structure of Yamada et al. is not to improve the crystallinity and crystal orientation of the second wurtzite crystalline layer formed on the functional material layer. However, the prior art need not provide the same functions or benefits of the claimed invention, it only need to disclose each of the claimed structural elements.

32. Applicant argues that Yamada et al. does not disclose the claimed layer thicknesses, and argues that based on the illustrations, the thickness of the piezoelectric layer is much greater than that of the electrode layers. However, based on the description in paragraphs 141 and 142, this

does not have to be the case, and the thicknesses of the piezoelectric layers and electrode layers include values within the claimed ranges.

Conclusion

33. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is (571) 272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Quyen Leung can be reached on (571) 272-8188. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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